REVIEW AND EVALUATION OF CARB ANALYSES OF CRC-APRAC VE-1 DATA

By: Louis J. Painter
Statistical Consultant

CARB'S MULTIPLE REGRESSION

- Analysis is Incomplete
- No Analysis of Residuals
- "Arbitrary" Use of "95%" Significance Decision Rule

SIGNIFICANCE OF RESULTS

- **One-Sided or Two-Sided Tests?**

  Q: Does Lower Sulfur → Lower PM's?

  = One-Sided Test

  Q: Does Decreasing Sulfur Change (Increase or Decrease) NO_x?

  = Two-Sided Test

These Are Technical Decisions to be Made

SIGNIFICANCE OF RESULTS
Continued

- High Significance Requirements → Fewer "Significant" Factors

- To Use a Variable for Control (Regulation) Requires High Significance
  - High Confidence
  - Good Precision
  - Clear and Convincing Evidence

SIGNIFICANCE OF RESULTS
Continued

From CARB Multiple Regressions Results

Aromatics (FIA): No Question - Significant

Sulfur Effects:

	PM		NO_x	
	Coeff.	% Signif.*	Coeff.	% Signif.
CS NTCC	0.196	97.40	-0.335	94.6
CS DDC	0.157	99.97	-0.022	52.8
HS NTCC	0.067	93.40	-0.438	99.1
HS DDC	0.314	99.99	-0.350	94.0

*One-Sided Basis, $(1 - \frac{P}{2}) * 100$

RECOMMENDATION

Global Analysis

{PM, NO_x, HC, CO} Versus Arom., Sulfur, T_{90},
Arom. * Sulfur,
Arom. * T_{90},

Engine,
Engine * Arom,
Engine * Sulfur,
Engine * T_{90}

Time

- Time Effect

  Real?

  - Smooth Trend
  - Erratic

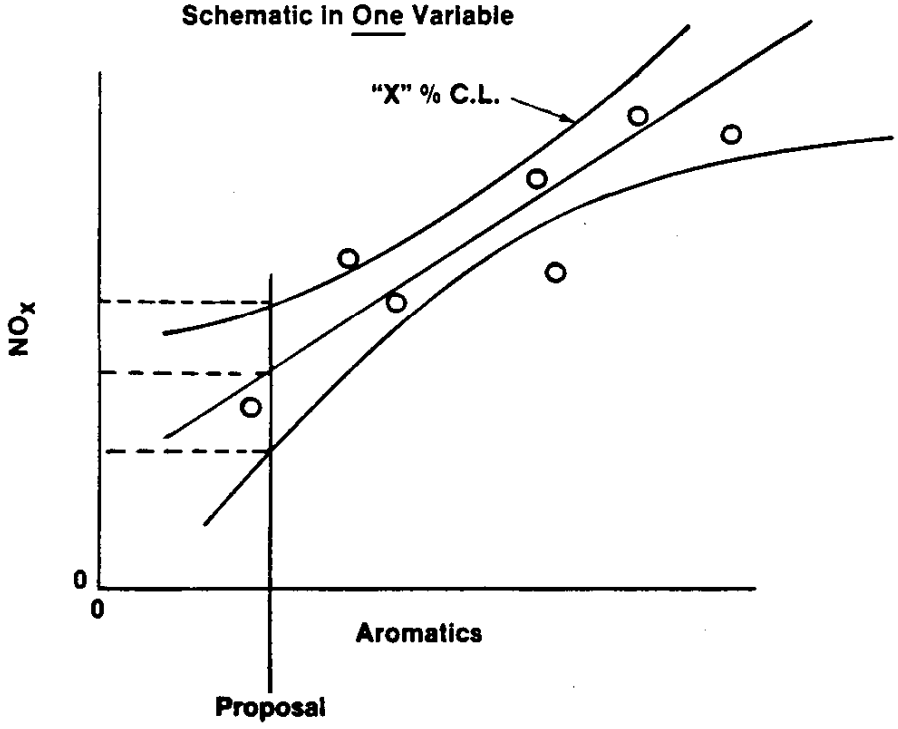
WHICH VARIABLES?

- **Design Variables**
  - Aromatics
  - Sulfur
  - T_{90}
- **Engineering Variables**
  - Cetane Number
  - Multi-Ring Aromatics
  -
  -
  -
- **For Which Responses**
  - Particulates
  - NO_x
  - HC
  - CO

ESTIMATED BENEFIT OF SULFUR, AROMATICS REDUCTIONS

- Uncertainty

Schematic in One Variable



RECOMMENDATIONS

- Global Analysis
- Consider Time Effects
- Technical Judgement on Variables
- Technical Judgement on Significance Tests
- Uncertainty Analysis

IMPACTS ON DIESEL FUEL USERS

By: Mike Ingham
Chevron Research Company

IMPACTS ON DIESEL FUEL USERS

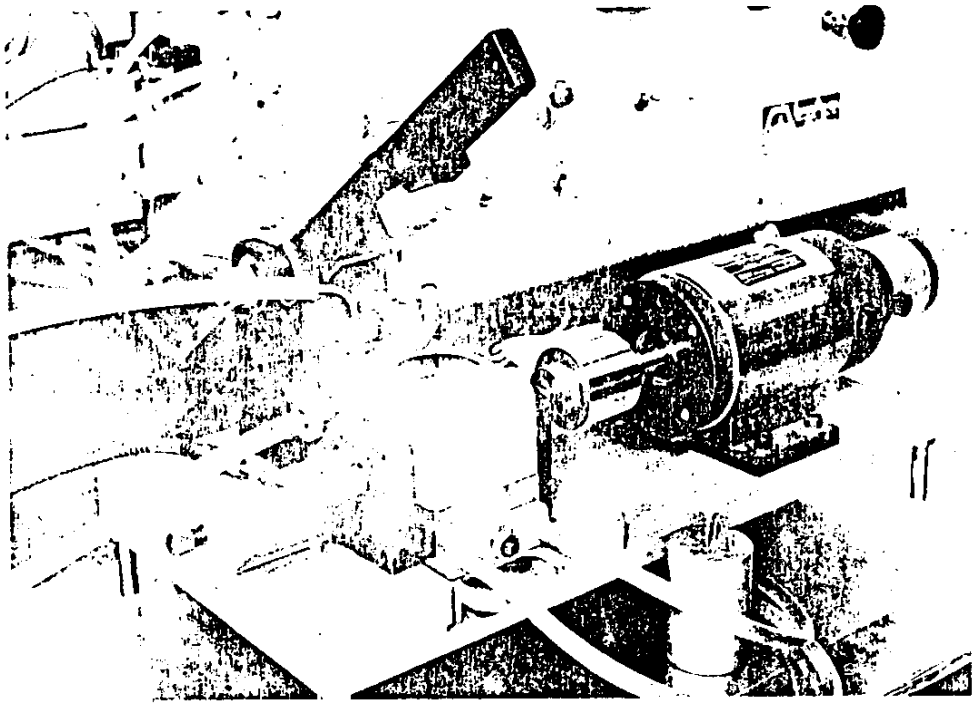
- Engine Durability
- Fuel Economy
- Low Temperature Performance

DIESEL ENGINE DURABILITY

- Severe Hydroprocessing Reduces Fuel Lubricity
- Lubricity Tests of a 10% Aromatics Fuel* Show 8-9 Times Higher Wear Rate Than Current Diesel Fuels
- One Major Engine Manufacturer Has Reported Premature Fuel System Failures with Low Aromatics Fuel

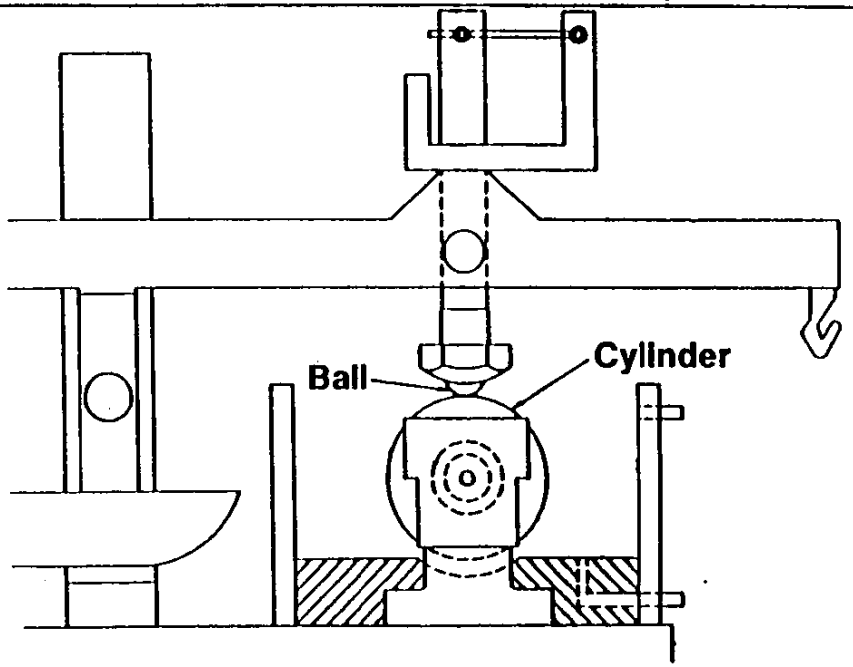
*CRC VE-1 Project Fuel 8

BALL-ON-CYLINDER LUBRICITY EVALUATOR



Chevron Research Company
Richmond, California

SCHEMATIC OF BALL-ON-CYLINDER LUBRICITY EVALUATOR (BOCLE)



PHOTOGRAPH OF BOCLE WEAR SCAR

Chevron Research Company
Richmond, California

SEVERE HYDROPROCESSING REDUCES FUEL LUBRICITY

Fuel	BOCLE Results	
	Wear Scar Diameter, mm	Relative Mass Wear Rate
Commercial Products		
Chevron Richmond Diesel No. 2	0.64	1.4
Chevron El Segundo Low Sulfur No. 2	0.58	1.2
Chevron Richmond Jet A	0.66	1.2
Effect of Severe Hydroprocessing		
Before Hydroprocessing	0.62	1.0
Hydroprocessed to 10% Aromatics*	1.01	8.7
Cummins Test Program		
Dodecane	0.94	7.8

Cummins reports premature fuel system failures in LTA-300 engine running on dodecane. 10% aromatics fuel has a higher wear rate than dodecane.

*CRC VE-1 Project Fuel 8

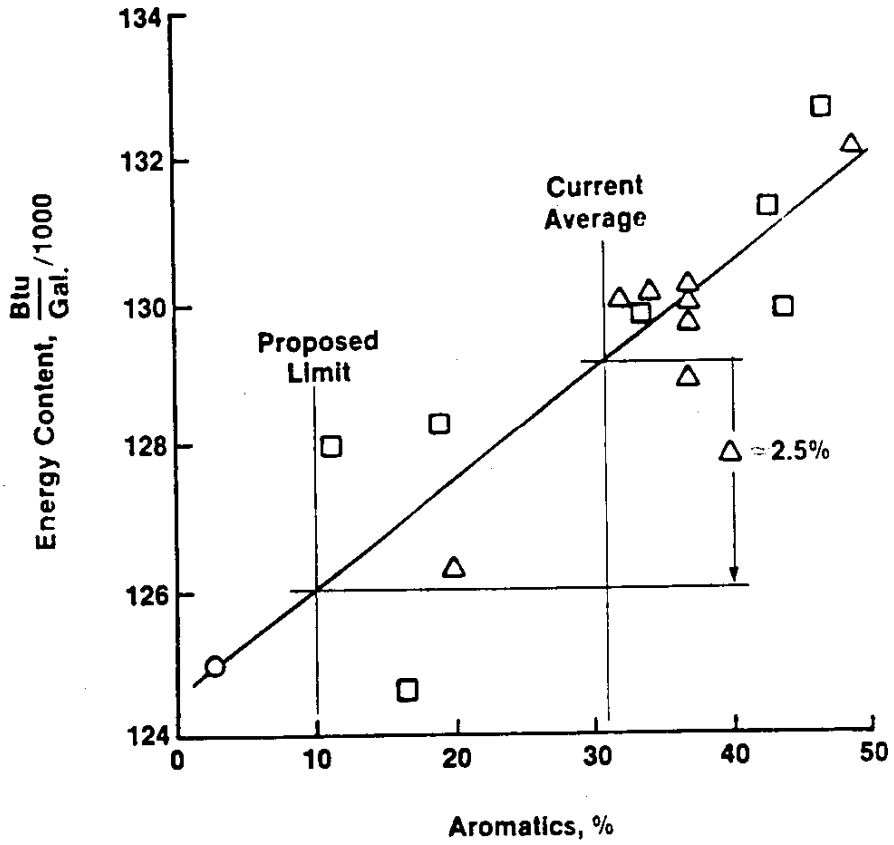
POTENTIAL EFFECTS OF ACCELERATED FUEL SYSTEM WEAR

- Increased Maintenance Costs
- Increased Emissions
- Reduced Fuel Economy

DIESEL FUEL ECONOMY

- Severe Hydroprocessing Reduces Volumetric Energy Content
- 10% Aromatics Diesel Fuel has ~2.5% Lower Energy Content Than Current Fuels
- Vehicle Fuel Economy Will be Reduced Proportionately

EFFECT OF DIESEL FUEL AROMATICS REDUCTION ON ENERGY CONTENT



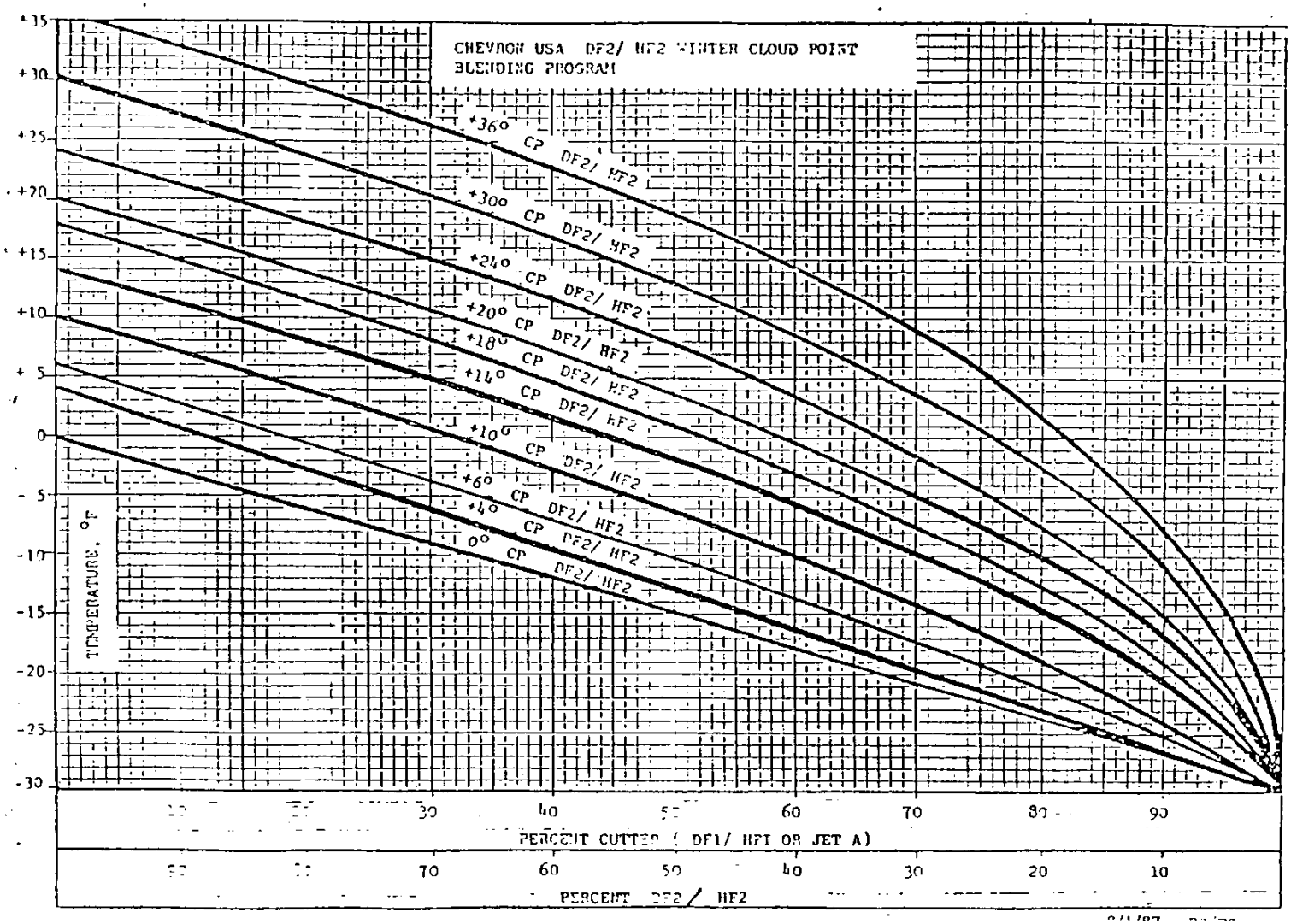
LOW TEMPERATURE PERFORMANCE

- Hydroprocessing Increases Diesel Fuel Cloud Point
- Severe Hydroprocessing Required for 10% Aromatics Diesel Fuel* Increased Cloud Point by 7°F (From 29 to 36°F)
- Winter Cloud Point Specifications Require Jet Blending
- 10% Aromatics Diesel Fuel* Requires Excessive Blending

Location	Target CP, °F	Period	Percent of Jet Required CP = 29°F	Percent of Jet Required CP = 36°F*
Sacramento	24	Oct.-Feb.	16	36
Lake Tahoe	0	Dec.-Feb.	74	82

- Increased Fuel Filter Wax Plugging Can be Expected with Proposed Fuel Specification

*CRC VE-1 Project Fuel 8


CHEVRON USA DF2/ HF2 WINTER CLOUD POINT
BLENDING PROGRAM
+36° CP DF2/ HF2
+30° CP DF2/ HF2
+24° CP DF2/ HF2
+20° CP DF2/ HF2
+18° CP DF2/ HF2
+14° CP DF2/ HF2
+10° CP DF2/ HF2
+6° CP DF2/ HF2
+4° CP DF2/ HF2
0° CP DF2/ HF2
TEMPERATURE, °F
+35
+30
+25
+20
+15
+10
+ 5
0
- 5
-10
-15
-20
-25
-30
30
40
50
60
70
80
90
PERCENT CUTTER (DF1/ HF1 OR JET A)
70
60
50
40
30
20
10
PERCENT DF2 / HF2

COST-EFFECTIVENESS OF DIESEL FUEL MODIFICATIONS FOR DIESEL ENGINE EMISSIONS REDUCTIONS

By: Mike Ingham
Chevron Research Company

FUEL MODIFICATION SCENARIOS

Fuel	Composition	
	S, Wt %	A, Vol %
1. Base	0.27	31
2. Low S	0.05	28
3. Low A	0.05	20
4. Ultra Low A	0.05	10

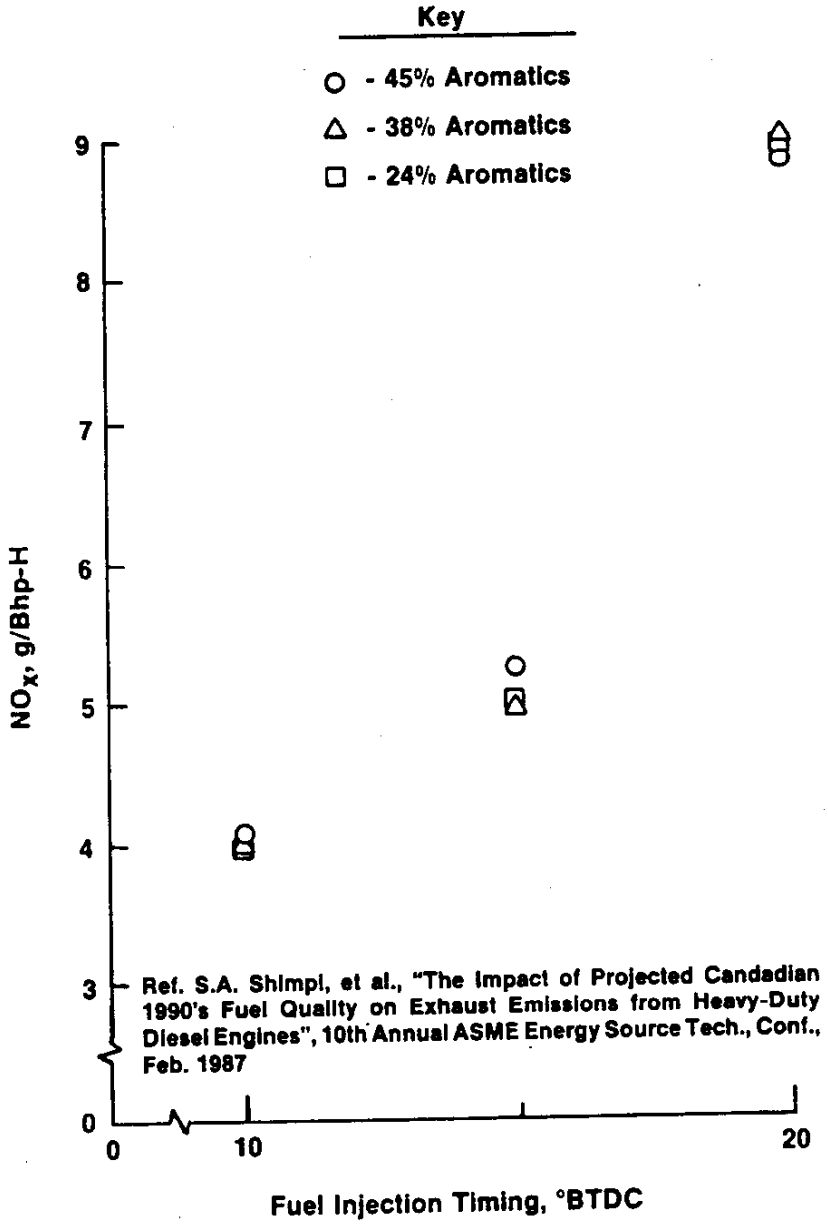
Comparison of Fuel Effects Sensitivity Data for
Heavy-Duty Diesel Particulate Emissions

BSP^{1} (g/bhp-Hr) = b(Aromatics, Vol %) + c(T_{90}, °C) + d(Sulfur, Wt %)

Engine, Test Mode, Reference	Aromatics Effect, x 10^{-3}		T_{90} Effect, x 10^{-4}		Sulfur Effect		No. of Fuels Tested
	b	σ^2	c	σ^2	d	σ^2	
Cummins NTC 290, Steady-State (1)[4]	2.6	0.36	4.8	1.7	0.35	0.03	42
Caterpillar 3406B, Steady-State (2)	0.54	0.63	-0.26	1.7	0.16	0.03	10
Caterpillar 3406B, Transient (2)	11.0	2.8	-4.2	10	N/A[3]	N/A	6
Cummins NTCC 400 Transient (3)	3.8	0.43	1.6	3.6	0.09	0.04	9
Detroit Diesel Series 60 Transient (3)	1.2	0.35	-2.6	2.6	0.28	0.03	9

[1]Brake-specific particulate emissions in grams per brake-horsepower-hour.
[2]Standard error of the coefficient for the effect.
[3]Sulfur content was not included as an independent variable in this regression.
[4]References: (1) SAE 841364 (2) SAE 852078 (3) CRC VE-1 Study.

EFFECT OF INJECTION TIMING ON NO_x CUMMINS NTCC-400

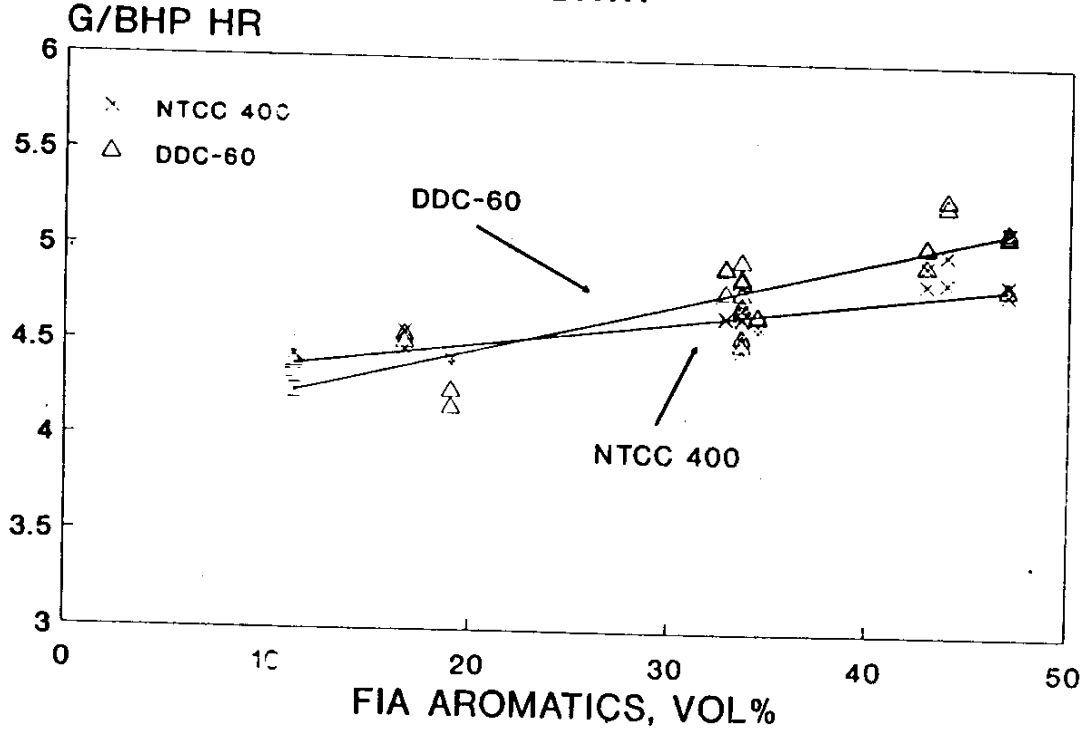


Ref. S.A. Shimpi, et al., "The Impact of Projected Candadian 1990's Fuel Quality on Exhaust Emissions from Heavy-Duty Diesel Engines", 10th Annual ASME Energy Source Tech., Conf., Feb. 1987

WEIGHTED NITROGEN OXIDES

EPA TRANSIENT TEST

VE-1 DATA

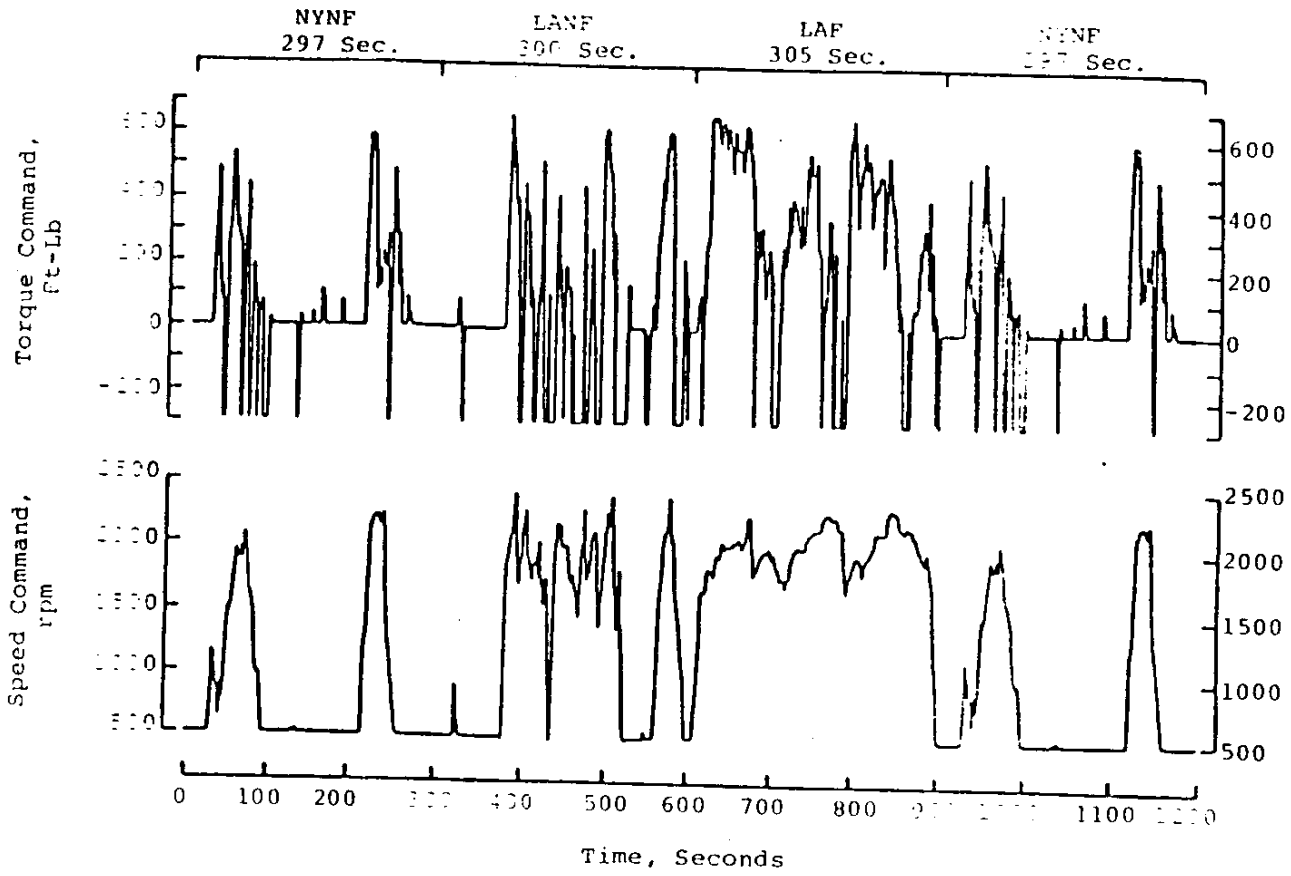


EFFECT OF CETANE NUMBER ON NO_x EMISSIONS
VE-1 Program--Detroit Diesel Series 60 Engine

		Test Cycle NO_x Emissions, g/bhp-H				
Fuel	Cetane	CS	HS	S-1	S-2	S-3
2	35.0	5.76	5.30	8.38	6.64	3.39
2T*	39.2	5.49	5.25	7.14	5.91	3.37

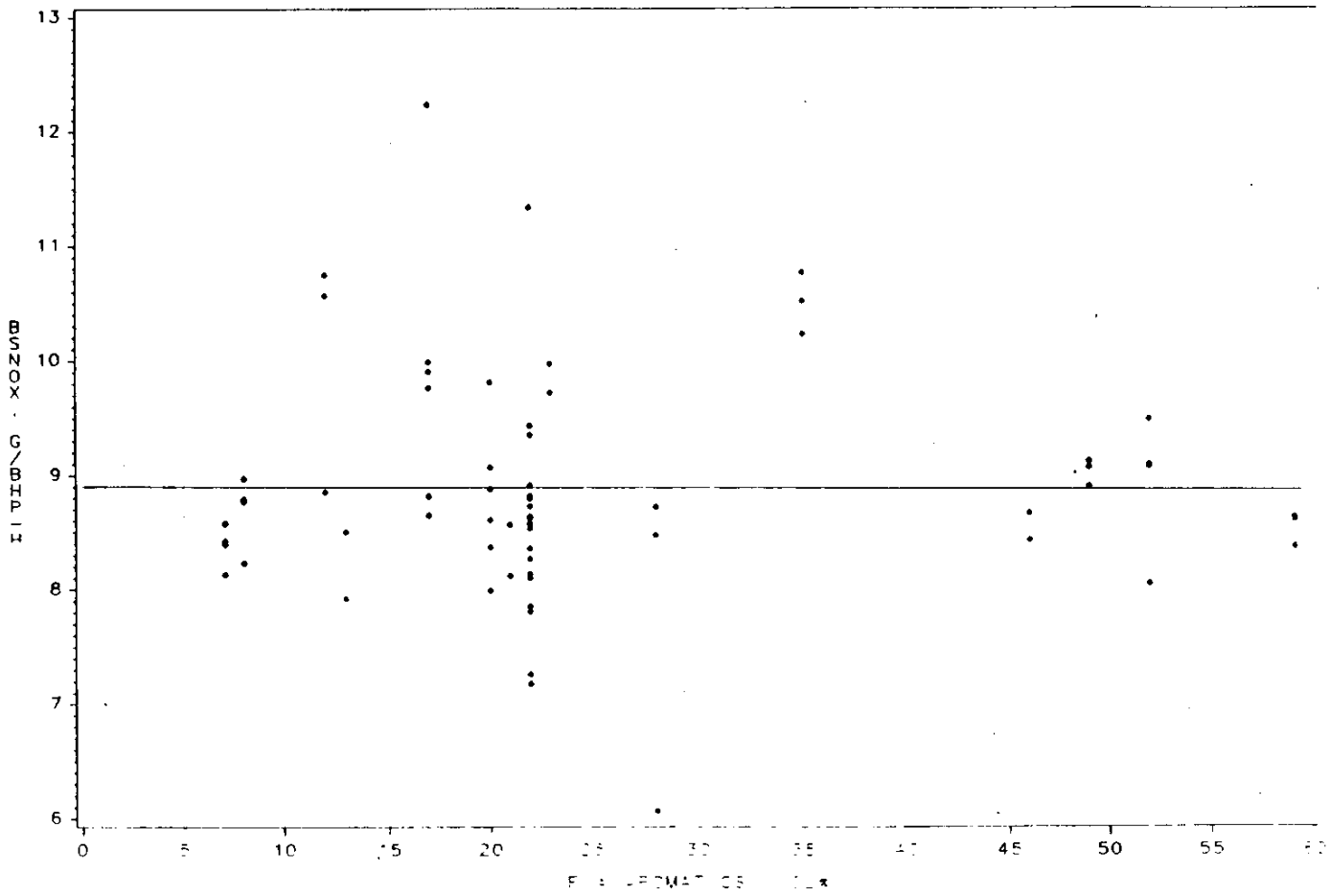
*Fuel 2T is Fuel 2 Doped with 1600 ppm Cetane Improver

TORQUE AND SPEED COMMANDS FOR EPA 1984 HEAVY DUTY
TRANSIENT FTP CYCLE - 250-HP DIESEL



CUMMINS NTC-290 NOX EMISSIONS VERSUS FIA AROMATICS CONTENT

REFERENCE SAE PAPER NO. 841364

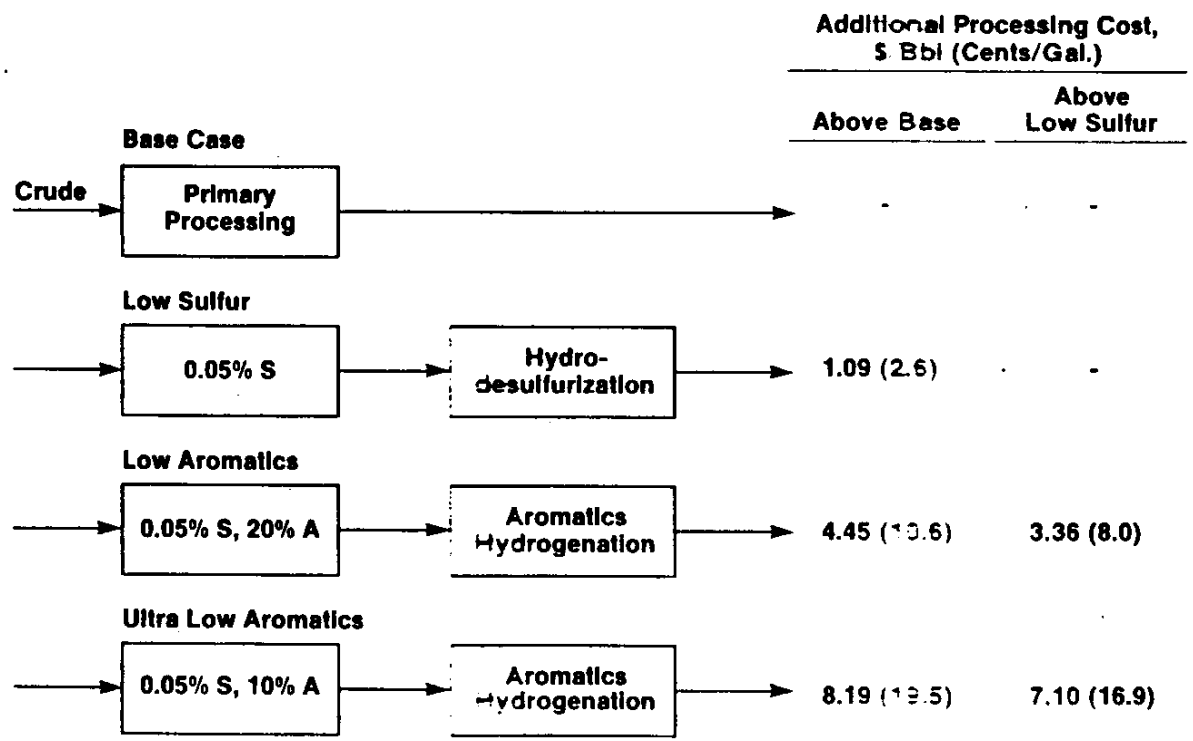


EFFECT OF FUEL MODIFICATIONS ON DIESEL-DERIVED PARTICULATE AND GASEOUS EMISSIONS

	Composition		Emissions, Lb/Bbl*				
			Directly Emitted Particulate				
Fuel	S, Wt %	A, Vol %	Carbonaceous	Sulfate	NO_x	SO_2	Total
1	0.27	31	0.39	0.14	8.39	1.58	10.50
2	0.05	28	0.38	0.03	8.20	0.29	8.90
3	0.05	20	0.36	0.03	7.69	0.29	8.37
4	0.05	10	0.33	0.03	7.06	0.29	7.71

*Detroit Diesel Series 60

MODIFIED DIESEL FUEL PROCESSING STEPS AND ASSOCIATED INCREMENTAL COSTS



COST-EFFECTIVENESS OF FUEL MODIFICATIONS FOR EMISSIONS REDUCTIONS

Fuel	Composition		Total Emissions Reduction* Lb/Bbl	Processing Cost Increase, $/Bbl	Cost-Effectiveness $/Lb
	S, Wt %	A, Vol %			
Compared to Base (0.27% S, 31% A):					
2	0.05	28	1.60	1.09	0.68
Incremental Compared to Low Sulfur:					
3	0.05	20	0.53	3.36	6.34
4	0.05	10	1.19	7.10	5.97

*Directly Emitted Particulate Plus SO_2 Plus NO_x

SENSITIVITY OF THE COST-EFFECTIVENESS OF FUEL MODIFICATIONS

- Sensitivity to the Assumed Rates of Change of Particulate and NO_x with Aromatics and Sulfur Contents
- Sensitivity to Fuel Processing Costs

SENSITIVITY OF COST-EFFECTIVENESS OF FUEL MODIFICATIONS TO ENGINE-SPECIFIC FUEL EFFECTS

Fuel	Composition		Total Emissions Reduction[1] Range, Lb/Bbl	Processing Cost Increase, $/Bbl	Cost-Effectiveness Range, $/Lb
	S, Wt %	A, Vol %			
Compared to Base (0.27% S, 31% A):					
2	0.05	28	1.41-1.60[2]	1.09	0.68-0.77
Incremental Compared to Low Sulfur:					
3	0.05	20	0.03-0.53[2]	3.36	6.34-112.00
4	0.05	10	0.07-1.19[2]	7.10	5.97-101.43

[1]Directly emitted particulate plus SO_2 plus NO_x.

[2]Range resulting from assumption of emissions sensitivities to aromatics and sulfur based on available data.

SENSITIVITY OF COST-EFFECTIVENESS OF FUEL MODIFICATIONS TO FUEL PROCESSING COSTS

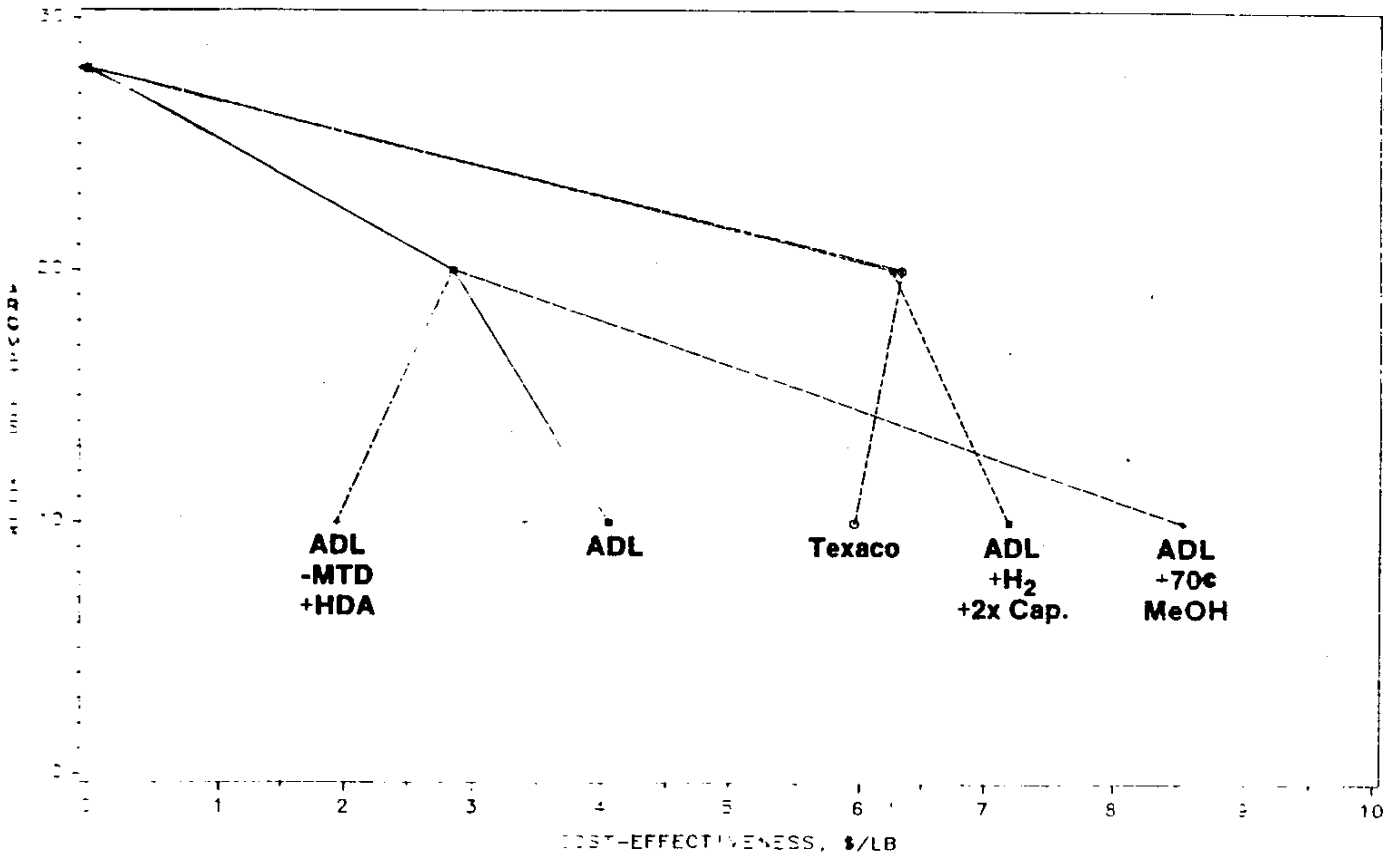
Fuel	Composition		Total Emissions Reduction[1], Lb/Bbl	Processing Cost Increase, Range[2], $/Bbl	Cost-Effectiveness Range, $/Lb
	S, Wt %	A, Vol %			
Compared to Base (0.27% S, 31% A):					
2	0.05	28	1.60	0.50-1.18	0.31-0.74
Incremental Compared to Low Sulfur:					
3	0.05	20	0.53	1.51-3.36	2.85-6.34
4	0.05	10	1.19	2.31-10.16	1.94-8.54

[1]Directly emitted particulate plus SO_2 plus NO_x.

[2]Range resulting from CARB adjustments to ADL costs.

INCREMENTAL COST–EFFECTIVENESS OF AROMATICS REGULATIONS

CARB FUEL PROCESSING COST SCENARIOS DEVELOPED BY ADJUSTING
ARTHUR D. LITTLE COST ESTIMATES FOR ADDITIONAL HYDROGEN
CAPACITY AND CAPITAL INVESTMENTS FOR METHANOL PRICE AND
FOR REPLACEMENT OF MOBIL METHANOL-TO-DISTILLATE PROCESS
WITH ADDITIONAL HYDRODEAROMATIZATION CAPACITY



CONCLUSIONS

- **Desulfurization**
  - **Yields Majority of Emissions Reduction Achievable by Diesel Fuel Modifications**
  - **Recommended to EPA by API, NPRA, and EMA**
  - **Endorsed by WOGA**
- **Aromatics Reductions**
  - **Yield Small Incremental Particulate Reductions**
  - **Yield Speculative NO_x Reductions**
  - **May Affect Engine Durability and Emissions**
  - **Will Reduce Fuel Economy**
  - **Have Significantly Poorer Cost-Effectiveness Than Desulfurization**

CHEVRON RESEARCH MID-DISTILLATE HYDROTREATER FUEL TEST PROGRAM RESULTS

1988 CUMMINS NTC-400 ENGINE
EPA HEAVY-DUTY TRANSIENT CYCLE
EL SEGUNDO FUEL

Fuel	Feed	Product	
Emission Result	AVG	AVG	%CHANGE
Work, BHP-hr	25.77	26.91	4.42
CO, g/BHP-hr	1.30	1.65	26.67
NOX, g/BHP-hr	5.53	5.41	-2.32
HC, g/BHP-hr	0.79	0.80	1.24
C-Fuel, lb/BHP-hr	0.40	0.39	-4.06
G-Fuel, lb/BHP-hr	0.42	0.41	-2.82
TPM, g/BHP-hr	0.26	0.24	-8.12
Fuel Properties			
Sulfur, wt.%	0.42	0.426 (1)	1.43
Nitrogen, ppm	441	247	-43.99
Arom., wt.% (FIAM)	28.8	26.2	-9.03
Arom., wt.% (MS)	27.8	23.9	-14.03
Mono., wt.% (MS)	14.1	16.0	13.48
Mult., wt.% (MS)	13.8	7.9	-42.75
Cetane No., (D613)	46.2	45.1	-2.38
Vis. CSt., (40C)	4.1	2.5	-39.86

(1) Product sulfur content was doped from 184 ppm S to 0.426 wt% S by using ditertiary butyl disulfide (DTBDS).

APPENDIX G

Text of Regulatory Proposals

PROPOSED SECTION 2255 -- SULFUR CONTENT OF MOTOR VEHICLE DIESEL FUEL

NOTE: The entire text of Section 2255 set forth below is new language proposed to be added to the California Code of Regulations.

Section 2255. Sulfur Content of Diesel Fuel

(a) Regulatory Standard.

(1) On or after January 1, 1993, no person shall sell, offer for sale, or supply any vehicular diesel fuel which has a sulfur content exceeding 500 parts per million by weight.

(2) Subsection (a)(1) shall not apply to a transaction where: (I) the person selling, offering for sale, or supplying the diesel fuel demonstrates that s/he has taken reasonable precautions to assure that the diesel fuel will be dispensed to motor vehicles only at altitutes above 3000 feet above sea level and only between November 1 and March 31, and (II) the diesel fuel has a sulfur content not exceeding 1500 parts per million by weight.

(3) Subsection (a)(1) shall not apply to a sale, offer for sale, or supply of diesel fuel to a refiner where the refiner further processes the diesel fuel at the refiner's refinery prior to any subsequent sale, offer for sale, or supply of the diesel fuel.

(4) For the purposes of subsection (a)(1), each sale of diesel fuel at retail for use in a motor vehicle, and each supply of diesel fuel into a motor vehicle fuel tank, shall also be deemed a sale or supply by any person who previously sold or supplied such diesel fuel in violation of subsection (a)(1).

(b) **Definitions.**

For the purposes of this section:

(1) "Diesel fuel" means any fuel that is commonly or commercially known, sold or represented as diesel fuel No. 1-D or No. 2-D, pursuant to the specifications in ASTM Standard Specification for Diesel Fuel Oils D 975-81.

(2) "Executive Officer" means the executive officer of the Air Resources Board, or his or her designee.

(3) "Further process" means to perform any activity on diesel fuel, including distillation, desulfurization, or blending, for the purpose of bringing the diesel fuel into compliance with the standard in subsection (a)(1).

(4) "Motor vehicle" has the same meaning as defined in Section 415 of the Vehicle Code.

(5) "Produce" means to convert liquid compounds which are not diesel fuel into diesel fuel.

(6) "Producer" means any person who produces vehicular diesel fuel in California.

(7) "Refiner" means any person who owns, leases, operates, controls or supervises a refinery.

(8) "Refinery" means a facility that produces liquid fuels by distilling petroleum.

(9) "Supply" means to provide or transfer a product to a physically separate facility, vehicle, or transportation system.

(10) "Vehicular diesel fuel" means any diesel fuel (A) which is not conspicuously identified as a fuel which may not lawfully

be dispensed into motor vehicle fuel tanks in California; or (B) which the person selling, offering for sale, or supplying the diesel fuel knows will be dispensed into motor vehicle fuel tanks in California; or (C) which the person selling, offering for sale, or supplying the diesel fuel in the exercise of reasonable prudence should know will be dispensed into motor vehicle fuel tanks in California, and that is not the subject of a declaration under penalty of perjury by the purchaser, offeree or recipient stating that s/he will not sell, offer for sale, or transfer the fuel for dispensing, or dispense the fuel, into motor vehicle fuel tanks in California.

(c) Test Method.

The sulfur content of diesel fuel limitation specified in subsection (a)(1) shall be determined by ASTM Test Method D 2622-82, or any other test method determined by the executive officer to give equivalent results.

(d) Presumed Sulfur Content of Diesel Fuel Represented As Being for Nonvehicular Use.

All diesel fuel which has been identified or represented as a fuel which may not be dispensed into motor vehicles in California shall be deemed to have a sulfur content exceeding 500 parts per million by weight, as determined by a test method identified in subsection (c), unless the fuel is tested in accordance with a method identified in subsection (c) and is shown to have a sulfur content of 500 parts per million by weight or less.

(e) Variances.

(1) Any person who cannot comply with the requirements set forth in subsection (a)(1) because of extraordinary reasons beyond the person's reasonable control may apply to the executive officer for a variance. The application shall set forth:

(A) the specific grounds upon which the variance is sought;

(B) the proposed date(s) by which compliance with the provisions of subsection (a)(1) will be achieved; and

(C) a plan reasonably detailing the method by which compliance will be achieved.

(2) Upon receipt of an application for a variance containing the information required in subsection (e)(1), the executive officer shall hold a hearing to determine whether, or under what conditions and to what extent, a variance from the requirements in established by subsection (a)(1) is necessary and will be permitted. Notice of the time and place of the hearing shall be sent to the applicant by certified mail not less than 20 days prior to the hearing. Notice of the hearing shall also be submitted for publication in the California Administrative Notice Register and sent to every person who requests such notice, not less than 20 days prior to the hearing.

(3) At least 20 days prior to the hearing, the application for the variance shall be made available to the public for inspection. Interested members of the public shall be allowed a reasonable opportunity to testify at the hearing and their testimony shall be considered.

(4) No variance shall be granted unless all of the following findings are made:

(A) that, because of reasons beyond the reasonable control of the applicant, requiring compliance with subsection (a)(1) would result in an extraordinary economic hardship;

(B) that the public interest in mitigating the extraordinary hardship to the applicant by issuing the variance outweighs the public interest in avoiding any increased emissions of air contaminants which would result from issuing the variance.

(C) that the compliance plan proposed by the applicant can reasonably be implemented and will achieve compliance as expeditiously as possible.

(5) Any variance order shall specify a final compliance date by which the requirements in subsection (a)(1) will be achieved. Any variance order shall also contain a condition that specified increments of progress necessary to assure timely compliance be achieved, and such other conditions, including limitations on the sulfur content of diesel fuel produced for use in motor vehicles, that the executive officer, as a result of the testimony received at the hearing, finds necessary to carry out the purposes of Division 26 of the Health and Safety Code.

(6) The executive officer may require, as a condition of granting a variance, that a cash bond, or a bond executed by two or more good and sufficient sureties or by a corporate surety, be posted by the party to whom the variance was granted to assure performance of any construction, alteration, repair, or other

work required by the terms and conditions of the variance. Such bond may provide that, if the party granted the variance fails to perform such work by the agreed date, the cash bond shall be forfeited to the state board, or the corporate surety or sureties shall have the option of promptly remedying the variance default or paying to the state board an amount, up to the amount specified in the bond, that is necessary to accomplish the work specified as a condition of the variance.

(7) No variance from the requirements set forth in subsection (a)(1) based on a plan for compliance which includes the installation of major additional equipment shall be issued to a producer where installation of the equipment was not included in a compliance plan and updates submitted pursuant to subsection (f). No such variance shall have a duration of more than three years.

(8) No variance which is issued due to conditions of breakdown, repair, or malfunction of equipment shall have a duration, including extensions, of more than six months.

(9) The executive officer may, after holding a hearing without complying with the provisions of subsections (e)(2) and (e)(3), issue an emergency variance to a person from the requirements of subsections (a)(1) upon a showing or reasonably unforeseeable extraordinary hardship and good cause that a variance is necessary. In connection with the issuance of an emergency variance, the executive officer may waive the requirements of subsection (e)(6). No emergency variance may

extend for a period of more than 45 days. If the applicant for an emergency variance does not demonstrate that he or she can comply with the provisions of subsection (a)(1) within such 45-day period, an emergency variance shall not be granted unless the applicant makes a prima facie demonstration that the findings set forth in subsection (e)(4) should be made. The executive officer shall maintain a list of persons who have informed the executive officer in writing of their desire to be notified by telephone in advance of any hearing held pursuant to this paragraph (e)(9), and shall provide advance telephone notice to any such person.

(10) A variance shall cease to be effective upon failure of the party to whom the variance was granted substantially to comply with any condition.

(11) Upon the application of any person, the executive officer may review and for good cause modify or revoke a variance from the requirements of subsection (a)(1) after holding a hearing in accordance with the provisions of subsections (e)(2) and (e)(3).

(f) Submittal of Compliance Plan.

Each producer shall, by January 1, 1990, submit to the executive officer a plan showing the producer's schedule for achieving compliance with subsection (a)(1). Each producer shall, by January 1, 1991 and January 1, 1992, submit an update of the plan.

NOTE: Authority cited: Sections 39600, 39601, 43013, and 43101 of the Health and Safety Code. Reference: Sections 39000, 39001, 39002, 39003, 39500, 39315, 39516, 41511, 43000, 43016, and 43101, Health and Safety Code, and Western Oil and Gas Ass'n. v. Orange County Air Pollution Control District, 14 Cal. 3d 411, 121 Cal. Rptr. 249 (1975).

PROPO9SED SECTION 2256 -- AROMATIC HYDROCARBON CONTENT OF MOTOR VEHICLE DIESEL FUEL

NOTE: The entire text of Section 2256 set forth below is new language proposed to be added to the California Code of Regulations.

Section 2256. Aromatic Hydrocarbon Content of Diesel Fuel

(a) Regulatory Standard.

(1) On or after January 1, 1993, except as otherwise provided in this subsection (a), no person shall sell, offer for sale, or supply any vehicular diesel fuel unless:

(A) The aromatic hydrocarbon content does not exceed 10 percent by volume; or

(B) In the case of vehicular diesel fuel that has been reported in accordance with all of the requirements of subsection (d),

(i) The aromatic hydrocarbon content does not exceed the designated alternative limit, and

(ii) Where the designated alternative limit exceeds 10 percent by volume, the excess aromatic hydrocarbon content is fully offset in accordance with subsection (d); or

(C) The vehicular diesel fuel is exempt under subsection (e) and the aromatic hydrocarbon content does not exceed 20 percent by volume.

(2) Subsection (a)(1) shall not apply to the sale, offer for sale, or supply of any diesel fuel blend for which the executive officer has issued a waiver pursuant to subsection (g).

(3) Subsection (a)(1) shall not apply to a sale, offer for sale, or supply of vehicular diesel fuel to a refiner where the

refiner further processes the diesel fuel at the refiner's refinery prior to any subsequent sale, offer for sale, or supply of the diesel fuel.

(4) For the purposes of subsection (a)(1), each sale of diesel fuel at retail for use in a motor vehicle, and each supply of diesel fuel into a motor vehicle fuel tank, shall also be deemed a sale by any person who previously sold or supplied such diesel fuel in violation of subsection (a)(1).

(b) Definitions.

For the purposes of this section:

(1) "Criteria pollutant" means any pollutant for which the state board or the U.S. Environmental Protection Agency has established an ambient air quality standard pursuant to Division 26 of the Health and Safety Code or the federal Clean Air Act.

(2) "Designated alternative limit" means an alternative aromatic hydrocarbon limit, expressed in percent aromatic hydrocarbon content by volume, which is assigned by a producer or importer to a final blend of vehicular diesel fuel pursuant to subsection (d).

(3) "Diesel fuel" means any fuel that is commonly or commercially known, sold or represented as diesel fuel No. 1-D or No. 2-D, pursuant to the specifications in ASTM Standard Specification for Diesel Fuel Oils D 975-81.

(4) "Exempt volume" means 55 percent of the average of the highest three year annual production volumes of distillate fuel reported for a small refiner's California refinery in the period

1983 to 1987, inclusive, to the California Energy Commission as required by the Petroleum Industry Information Reporting Act of 1980 (Public Resources Code Sections 25350 et seq.).

(5) "Executive Officer" means the executive officer of the Air Resources Board, or his or her designee.

(6) "Final blend" means a distinct quantity of diesel fuel which is introduced into commerce in California without further alteration which would tend to affect the fuel's aromatic hydrocarbon content.

(7) "Further process" means to perform any activity on diesel fuel, including distillation, treating with hydrogen, or blending, for the purpose of bringing the diesel fuel into compliance with the standards in subsection (a)(1).

(8) "Importer" means any person who first accepts delivery in California of vehicular diesel fuel.

(9) "Import facility" means the facility at which imported diesel fuel is first received in California, including, in the case of diesel fuel imported by cargo tank and delivered directly to a facility for dispensing diesel fuel into motor vehicles, the cargo tank in which the diesel fuel is imported.

(10) "Motor vehicle" has the same meaning as defined in Section 415 of the Vehicle Code.

(11) "Produce" means to convert liquid compounds which are not diesel fuel into diesel fuel; provided that when a person blends volumes of blendstocks which are not diesel fuel with volumes of diesel fuel acquired from another person, and the

resulting blend is diesel fuel, the person conducting such blending has produced the entire volume of the resulting blend and the person who initially converted non-diesel compounds into the acquired diesel fuel has also produced the volume of acquired diesel fuel. When a person blends diesel fuel with other volumes of diesel fuel, without the addition of blendstocks which are not diesel fuel, the person does not produce diesel fuel.

(12) "Producer" means any person who produces vehicular diesel fuel in California.

(13) "Refiner" means any person who owns, leases, operates, controls or supervises a refinery.

(14) "Refinery" means a facility that produces liquid fuels by distilling petroleum. A small refiner's refinery includes all bulk storage and bulk distribution facilities jointly owned or leased with the facility that produces liquid fuels by distilling petroleum.

(15) "Small refiner" means any refiner who owns or operates a refinery in California that:

(A) Has and at all times had since January 1, 1978, a crude oil capacity of not more than 50,000 barrels per stream day;

(B) Has not been at any time since September 1, 1988, owned or controlled by any refiner that at the same time owned or controlled refineries in California with a total combined crude oil capacity of more than 50,000 barrels per stream day; and

(C) Has not been at any time since September 1, 1988, owned or controlled by any refiner that at the same time owned or

controlled refineries in the United States with a total combined crude oil capacity of more than 137,500 barrels per stream day.

(16) "Stream day" means 24 consecutive hours of actual operation of a refinery.

(17) "Supply" means to provide or transfer a product to a physically separate facility, vehicle, or transportation system.

(18) "Vehicular diesel fuel" means any diesel fuel (A) which is not conspicuously identified as a fuel which may not lawfully be dispensed into motor vehicle fuel tanks in California; or (B) which the person selling, offering for sale, or supplying the diesel fuel knows will be dispensed into motor vehicle fuel tanks in California; or (C) which the person selling, offering for sale, or supplying the diesel fuel in the exercise of reasonable prudence should know will be dispensed into motor vehicle fuel tanks in California, and that is not the subject of a declaration under penalty of perjury by the purchaser, offeree or recipient stating that s/he will not sell, offer for sale, or transfer the fuel for dispensing, or dispense the fuel, into motor vehicle fuel tanks in California.

(c) Test Method.

The aromatic hydrocarbon content limitation specified in subsection (a) shall be determined by ASTM Test Method D 1319-84, or any other test method determined by the executive officer to give equivalent results.

(d) Designated Alternative Limit.

(1) A producer or importer may assign a designated alternative limit in accordance with this subsection (d) to a final blend of vehicular diesel fuel produced or imported by the producer or importer. In no case may the designated alternative limit be less than the aromatic hydrocarbon content of the final blend shown by the sample and test conducted pursuant to subsection (f).

(2) The producer or importer shall notify the executive officer of the volume (in gallons) and the designated alternative limit of the final blend. This notification shall be received by the executive officer before the start of physical transfer of the diesel fuel from the production or import facility, and in no case less than 12 hours before the producer either completes physical transfer or commingles the final blend.

(3) Within 90 days before or after the start of physical transfer of any final blend of vehicular diesel fuel to which a producer or importer has assigned a designated alternative limit exceeding 10 percent, the producer or importer shall complete physical transfer from the production or import facility of vehicular diesel fuel in sufficient quantity and with a designated alternative limit sufficiently below the limit specified in subsection (a)(1)(A) to offset the volume of aromatic hydrocarbons in the diesel fuel reported in excess of the limit.

(4) If, through no intentional or negligent conduct, a producer or importer cannot report within the time period specified in subsection (d)(2), then the producer or importer shall notify the executive officer of the required data as soon as reasonably possible and shall provide a written explanation of the cause of the delay in reporting. If, based on the written explanation and the surrounding circumstances, the executive officer determines that the conditions of this subsection (d)(4) are met, timely notification shall be deemed to have occurred.

(5) The executive officer may enter into a protocol with any individual producer or importer for the purposes of specifying how the requirements in subsections (d)(2) and (3) shall be applied to the producer's or importer's particular operations, as long as the executive officer reasonably determines that application of the regulatory requirements under the protocol is not significantly less stringent or enforceable than application of the express terms of subsections (d)(2) and (3). The terms of such a protocol shall be limited to one or more of the following: specification of alternative events from which the notification and offset periods are measured, including physical transfer from a production or import facility; provision for flexibility in the deadlines for reporting batches with designated alternative limits to accomodate normal business hours. Any such protocol shall include the producer's or importer's agreement to be bound by the terms of the protocol.

(6) No person shall sell, offer for sale, or supply vehicular diesel fuel, in a final blend to which a producer or importer has assigned a designated alternative limit exceeding 10 percent aromatics content, where the total volume of the final blend sold, offered for sale, or supplied exceeds the volume reported to the executive officer pursuant to subsection (d)(2) or (5).

(7) No person shall shall sell, offer for sale or supply vehicular diesel fuel, in a final blend to which a producer or importer has assigned a designate alternative limit less than 10 percent aromatics content, where the total volume of the final blend sold, offered for sale, or supplied is less than the volume reported to the executive officer pursuant to subsection (d)(2) or (5).

(e) Small Refiner Diesel Fuel.

(1) The provisions of subsection (a)(1)(A) and (B) shall not apply to the diesel fuel that is produced by a small refiner at the small refiner's California refinery and that is first consecutively supplied from the refinery in each calendar year for use in motor vehicles, up to the small refiner's exempt volume. This exemption shall not apply to any diesel fuel supplied from a small refiner's refinery in any calendar quarter in which less than 25 percent of the diesel fuel supplied from the refinery was produced from the distillation of crude oil at the refinery.

(2) To qualify for an exemption under this subsection (e), a refiner shall submit to the executive officer an application for exemption executed in California under penalty of perjury, on a form provided by the executive officer, for each of the small refiner's California refineries. The application shall specify the crude oil capacity of the refinery at all times since January 1, 1978, the crude oil capacities of all the refineries in California and the United States which are owned or controlled by, or under common ownership or control with, the small refiner since September 1, 1988, data demonstrating that the refinery has the capacity to produce liquid fuels by distilling petroleum, and copies of the reports made to the California Energy Commission as required by the Petroleum Industry Reporting Act of 1980 (Public Resources Code Sections 25350 et seq.) showing the annual production volumes of distillate fuel at the small refiner's California refinery for 1983 through 1987. Within 90 days of receipt of the application, the executive officer shall grant or deny the exemption in writing. The exemption shall be granted if the executive officer determines that the applicant has demonstrated that s/he meets the provisions of subsection (b)(15), and shall identify the small refiner's exempt volume. The exemption shall immediately cease to apply at any time the refiner ceases to meet the definition of small refiner in subsection (b)(15).

(3) In addition to the requirements of subsection (f) below, each small refiner who is covered by an exemption shall submit to

the executive officer reports containing the information set forth below for each of the small refiner's California refineries. The reports shall be executed in California under penalty of perjury, and must be received within the time indicated below:

(A) The quantity, ASTM grade, aromatic hydrocarbon content, and batch identification of all diesel fuel, produced by the small refiner, that is supplied from the small refinery in each month for sale for use in motor vehicles, within 15 days after the end of the month;

(B) For each calendar quarter, a statement whether 25 percent or more of the diesel fuel transferred from the small refiner's refinery that was produced by the distillation of crude oil at the small refiner's refinery, within 15 days after the close of such quarter;

(C) The date, if any, on which the small refiner completes transfer from its small refinery in a calendar year of the maximum amount of vehicular diesel fuel which is exempt from subsection (a)(1)(A) and (B) pursuant to subsection (e), within 5 days after such date;

(D) Within 10 days after project completion, any refinery addition or modification which would affect the qualification of the refiner as a small refiner pursuant to subsection (b)(15); and

(E) Any change of ownership of the small refiner or the small refiner's refinery, within 10 days after such change of ownership.

(4) Whenever a small refiner fails to provide records identified in subsection(e)(3)(A) or (B) in accordance with the requirements of those subsections, the vehicular diesel fuel supplied by the small refiner from the small refiner's refinery in the time period of the required records shall be presumed to have been sold or supplied by the small refiner in violation of section (a)(1)(A).

(f) Testing and Recordkeeping.

(1) Each producer shall sample and test for aromatic hydrocarbon content each final blend of vehicular diesel fuel which the producer has produced, in accordance with an applicable test method identified in subsection (c). If a producer blends diesel fuel components directly to pipelines, tankships, railway tankcars or trucks and trailers, the loading(s) shall be sampled and tested for aromatic hydrocarbon content by the producer or authorized contractor. The producer shall maintain, for two years from the date of each sampling, records showing the sample date, product sampled, container or other vessel sampled, final blend volume, and the aromatic hydrocarbon content. In the event a producer sells, offers for sale, or supplies diesel fuel which the producer claims is not vehicular diesel fuel and which has an aromatic hydrocarbon content exceeding the standard set forth in subsection (a)(1), such producer shall maintain, for two years

from the date of any sale or supply of the fuel, records demonstrating that the diesel fuel was not vehicular diesel fuel when it was sold or supplied by the producer. All diesel fuel produced by the producer and not tested as vehicular diesel fuel by the producer pursuant to this subsection shall be deemed to have an aromatic hydrocarbon content exceeding 10 percent, unless the producer demonstrates that the diesel fuel meets the requirements of subsection (a)(1).

(2) Each importer shall sample and test for aromatic hydrocarbon content each shipment of vehicular diesel fuel which the importer has imported by tankship, pipeline, railway tankcars, trucks and trailers, or other means, in accordance with an applicable test method identified in subsection (c). The importer shall maintain, for two years from the date of each sampling, records showing the sample date, product sampled, container or other vessel sampled, the volume of the shipment, and the aromatic hydrocarbon content. All diesel fuel imported by the importer and not tested as vehicular diesel fuel by the importer pursuant to this subsection shall be deemed to have an aromatic hydrocarbon content exceeding 10 percent, unless the importer demonstrates that the diesel fuel meets the requirements of subsection (a)(1).

(3) A producer or importer shall provide to the executive officer any records required to be maintained by the producer or importer pursuant to this subsection (d) within 20 days of a written request from the executive officer if the request is

received before expiration of the period during which the records are required to be maintained. Whenever a producer or importer fails to provide records regarding a final blend of vehicular diesel fuel in accordance with the requirements of this subsection, the final blend of diesel fuel shall be presumed to have been sold by the producer in violation of subsection (a)(1).

(4) The executive officer may perform any sampling and testing deemed necessary to determine compliance by any person with the requirements of subsection (a) and may require that special samples be drawn and tested at any time.

(5) The executive officer may enter into a protocol with any producer, importer, or person who sells, offers for sale, or transfers diesel fuel to a producer for the purpose of specifying alternative sampling, testing, recordkeeping, or reporting requirements which shall satisfy the provisions of subsections (f)(1), (f)(2), or (e)(3). The executive officer may only enter into such a protocol if s/he reasonably determines that application of the regulatory requirements under the protocol will be consistent with the state board's ability effectively to enforce the provisions of subsection (a). Any such protocol shall include the producer's or importer's agreement to be bound by the terms of the protocol.

(g) <u>Waivers for Diesel Fuel Containing Certain Additives.</u>

The executive officer, upon application of any producer or importer, may waive the prohibitions in subsection (a)(1) for a blend of diesel fuel containing an additive(s) if s/he determines

that the applicant has established that the blend of diesel fuel containing the additive(s), or a specified concentration thereof, results in no greater emissions of any criteria pollutant, precursor to any criteria pollutant, or any substance that has been identified by the state board as a toxic air contaminant, than vehicular diesel fuel having an aromatic hydrocarbon content not exceeding 10 percent.

(h) Variances.

(1) Any person who cannot comply with the requirements set forth in subsection (a)(1) because of extraordinary reasons beyond the person's reasonable control may apply to the executive officer for a variance. The application shall set forth:

(A) the specific grounds upon which the variance is sought;

(B) the proposed date(s) by which compliance with the provisions of subsection (a)(1) will be achieved; and

(C) a plan reasonably detailing the method by which compliance will be achieved.

(2) Upon receipt of an application for a variance containing the information required in subsection (h)(1), the executive officer shall hold a hearing to determine whether, or under what conditions and to what extent, a variance from the requirements in subsection (a)(1) is necessary and will be permitted. Notice of the time and place of the hearing shall be sent to the applicant by certified mail not less than 20 days prior to the hearing. Notice of the hearing shall also be submitted for publication in the California Regulatory Notice Register and sent

to every person who requests such notice, not less than 20 days prior to the hearing.

(3) At least 20 days prior to the hearing, the application for the variance shall be made available to the public for inspection. Interested members of the public shall be allowed a reasonable opportunity to testify at the hearing and their testimony shall be considered.

(4) No variance shall be granted unless all of the following findings are made:

(A) that, because of reasons beyond the reasonable control of the applicant, requiring compliance with subsection (a)(1) would result in an extraordinary economic hardship;

(B) that the public interest in mitigating the extraordinary hardship to the applicant by issuing the variance outweighs the public interest in avoiding any increased emissions of air contaminants which would result from issuing the variance.

(C) that the compliance plan proposed by the applicant can reasonably be implemented and will achieve compliance as expeditiously as possible.

(5) Any variance order shall specify a final compliance date by which the requirements in subsection (a)(1) will be achieved. Any variance order shall also contain a condition that specified increments of progress necessary to assure timely compliance be achieved, and such other conditions, including limitations on the aromatic hydrocarbon content of diesel fuel produced for use in motor vehicles, that the executive officer, as a result of the

testimony received at the hearing, finds necessary to carry out the purposes of Division 26 of the Health and Safety Code.

(6) The executive officer may require, as a condition of granting a variance, that a cash bond, or a bond executed by two or more good and sufficient sureties or by a corporate surety, be posted by the party to whom the variance was granted to assure performance of any construction, alteration, repair, or other work required by the terms and conditions of the variance. Such bond may provide that, if the party granted the variance fails to perform such work by the agreed date, the cash bond shall be forfeited to the state board, or the corporate surety or sureties shall have the option of promptly remedying the variance default or paying to the state board an amount, up to the amount specified in the bond, that is necessary to accomplish the work specified as a condition of the variance.

(7) No variance from the requirements set forth in subsection (a)(1) based on a plan for compliance which includes the installation of major additional equipment shall be issued to a producer where installation of the equipment was not included in a compliance plan and updates submitted pursuant to subsection (i). No such variance shall have a duration of more than three years.

(8) No variance which is issued due to conditions of breakdown, repair, or malfunction of equipment shall have a duration, including extensions, of more than six months.

(9) The executive officer may, after holding a hearing without complying with the provisions of subsections (h)(2) and (h)(3), issue an emergency variance to a person from the requirements of subsections (a)(1) upon a showing or reasonably unforeseeable extraordinary hardship and good cause that a variance is necessary. In connection with the issuance of an emergency variance, the executive officer may waive the requirements of subsection (h)(6). No emergency variance may extend for a period of more than 45 days. If the applicant for an emergency variance does not demonstrate that he or she can comply with the provisions of subsection (a)(1) within such 45-day period, an emergency variance shall not be granted unless the applicant makes a prima facie demonstration that the findings set forth in subsection (h)(4) should be made. The executive officer shall maintain a list of persons who have informed the executive officer in writing of their desire to be notified by telephone in advance of any hearing held pursuant to this paragraph (g)(9), and shall provide advance telephone notice to any such person.

(10) A variance shall cease to be effective upon failure of the party to whom the variance was granted substantially to comply with any condition.

(11) Upon the application of any person, the executive officer may review and for good cause modify or revoke a variance from the requirements of subsection (a)(1) after holding a hearing in accordance with the provisions of subsections (h)(2) and (h)(3).

(i) Submittal of Compliance Plan.

Each producer shall, by January 1, 1990, submit to the executive officer a plan showing the producer's schedule for achieving compliance with subsection (a)(1). Each producer shall, by the beginning of January 1, 1991 and January 1, 1992, submit an update of the plan.

NOTE: Authority cited: Sections 39600, 39601, 43013, and 43101 of the Health and Safety Code. Reference: Sections 39000, 39001, 39002, 39003, 39500, 39315, 39516, 41511, 43000, 43016, and 43101, Health and Safety Code, and Western Oil and Gas Ass'n. v. Orange County Air Pollution Control District, 14 Cal. 3d 411, 121 Cal. Rptr. 249 (1975).

PROPOSED AMENDMENTS TO SECTION 2252 -- SULFUR CONTENT

Amendments to Section 2252, Title 13,
California Code of Regulations

Amend the title of Section 2252, Title 13, California Code of Regulations, and add a new subsection (o), as follows:

Section 2252. Sulfur Content of Unleaded Gasoline and of Motor Vehicle Diesel Fuel Sold in the South Coast Air Basin or Ventura County Before January 1, 1993.

* * * *

(o) This section shall not apply to diesel fuel sold, offered for sale, or transferred on or after January 1, 1993.

NOTE: Authority cited: Sections 39600, 39601, 43013, and 43101 of the Health and Safety Code. Reference: Sections 39000, 39001, 39002, 39003, 39500, 39315, 39516, 41511, 43000, 43016, and 43101, Health and Safety Code, and Western Oil and Gas Ass'n. v. Orange County Air Pollution Control District, 14 Cal. 3d 411, 121 Cal. Rptr. 249 (1975).